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ABSTRACT

While 96% of teachers profess to use technology, this study of 85 teachers in grades 5-12 in Florida and Georgia found that only 4% of teachers actually integrated technology in their instruction. The majority of schools had few computers, fewer Internet-ready computers available for student access, and teachers who had never received any training concerning how to use computers. Most teachers lacked even a rudimentary knowledge of the Internet; many could not explain how to turn on a computer. The reality of public school classrooms contrasts sharply with the rhetoric and possibilities of using technology effectively in schools as exemplified by some interesting, high-tech classrooms. Topics discussed in this paper include: the disparity between reported and actual use of computers in instruction; the dilemma of "best practices" and teacher preparation; observations of one exemplary teacher; and the desperate need for models of best practice. A table summarizes major findings of the study. (Author/AEF)

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THE STATE OF THE 'NET IN IN SECONDARY CLASSROOMS: RHETORIC AND REALITY

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Abstract: While 96% of teachers profess to use technology, our study of 85 teachers in Florida and Georgia found that only 4% of teachers actually integrated technology in their instruction. The majority of schools had few computers, fewer Internet-ready computers available for student access, and teachers who had never received any training whatsoever concerning how to use computers. Most teachers lacked even a rudimentary knowledge of the Internet; many could not explain how to turn on a computer. The reality of public school classrooms contrast sharply with the rhetoric and possibilities of using technology effectively in schools as exemplified by some interesting, high-tech classrooms.

"While those who talk *about* schooling describe its penchant for change, teachers who *do* schooling proceed about their business in a manner that is remarkably resistant to change....the introduction of technology to classrooms does not radically change teaching; instead, technology can serve as a symbol of change." [Sandholtz, Ringstaff, & Dwyer, p. 171]

The point is well taken that most classrooms today look and sound as they did a hundred years ago—blackboards, functional seating with built-in desks and storage for books underneath, a pencil sharpener, an American flag, a teacher speaking at the front of the room. In contrast, the tools and the core knowledge of today's doctors, lawyers, accountants, dentists, engineers, police officers, and farmers would be unrecognizable to professionals from one hundred years ago. In many respects, the computer is perceived as a possible remedy for the flagrant datedness of most classrooms, and several federal and state initiatives continue to help bring computers into schools. Yet, getting prospective teachers to abandon pedagogical habits far removed from their comfort zones is no easy task. In fact, the complexities of integrating technology into the classroom seem to continually increase for teacher educators. But, the difficulty of the enterprise does not negate the potential that computers may offer. Many teacher education programs find themselves in the precarious position of mandating that their students gain expertise with computers while the school districts that may hire them may have classrooms straight out of 1898.

At the same time that the massive effort to equip schools with a necessary infrastructure for technology, some have begun to question the benefits of such investments, leading to speculations on the effects of technologies on teaching and learning [Dickey & Robyler, 1997; Dede, 1997; Oppenheimer, 1997]. Even technology enthusiasts would agree that simply unloading boxes of computers into K-12 classrooms will not improve instruction much. There is a need for practical examples of expert computer use in K-12 classrooms, a set of "best practices" that demonstrate how computers can be integrated into instruction to offer a clearly richer curriculum. In this article, we will discuss research from a three-year study of "best practices," describe the level of computer use in these classrooms, relate the findings to the preparation of prospective teachers, and briefly describe a day in the life of a teacher from the research study who might serve as a model of "best practices."

According to Fisher, Dwyer & Yocum [1996], criteria for best practices for the computer-literate teacher should include the following:

- Availability of tools for acquiring information, thinking, and communicating,
- Teacher's balanced used of instructional strategies--direct instruction, collaborative, and inquiry approaches to teaching and learning, and
- Ability to formulate innovative and variable assessments of student competencies and skills.

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In order to study the best practices of current teachers, we asked principals and administrators for a list of their most effective teachers who wouldn't mind being observed or videotaped. We logged over 500 hours in classrooms watching and videotaping 84 teachers [in grades 5-12] from Florida and Georgia over a period of three years. Administrators and teachers were told that the researchers were interested in "effective practices" and nothing about computers was ever mentioned.

The classrooms in Georgia and Florida are considered among the most sophisticated in the nation regarding the integration of technology. According to a report in *Education Week* [November 11, 1997], "Florida is one of the nation's leaders in school technology, and financial resources are a major reason why" [available: http://www.edweek.com/sreports/tc/intros/in-n.htm]. The student to computer ratio in Florida is purported to be 6:1.

Since 1994, the lottery in Georgia has provided more than half a billion dollars for technology in schools and the legislature also approved $15.4 million to pay for district technology specialists. The ratio of students to multi-media, Internet-ready computers is among the best in the nation in that category--13:1.

Computers in instruction: A disparity between reported and actual use

Teachers were observed from these subject areas--English, reading, math, science, social studies, family & consumer sciences, foreign language, and art, grades 5-12. All teachers observed had at least three years of experience, and a few had as many as 25. In general, the classrooms observed were not well equipped with computers, almost all teachers confessed that they had never received any form of professional development from their school districts regarding the integration of computers into instruction, and computers were not integrated into instruction. While we witnessed many innovative, unique, and highly effective lessons, the use of computers was conspicuously absent in 81 of 84 classrooms. Table 1 summarizes some major findings of the study.

Table 1: The integration of computers in instruction

	Florida	Georgia	Total
teachers observed	50	34	84
number of teachers whose classrooms contained no computers that could be accessed by students	48	30	78
number of teachers who have received professional development in the integration of computers in their teaching	0	2	2
number of teachers with one or more computer available for student use	2	4	6
number of teachers who used computers as part of their instructional strategies	0	3	3

Obviously, our findings of actual classroom practice differ markedly from reports attesting to the proliferation of computer use in schools. When surveyed, almost every teacher in the country says that they use computers to some degree in their teaching. According to Quality Education Data, 96% of teachers integrate computers in their instruction [1996]. The Tenth Planet Teachers & Technology survey found that 91% of K-6 teachers use computers with their students [1997]. The disparity between the results of these surveys and the actual approaches teachers took during our observations provided a rather startling contrast. Perhaps one problem with surveys of computer use is that they rely upon data that is self-reported. In the current age, when use of

technology has become associated with competency and modernity, little wonder that few teachers would admit that they never boot up. Still, the difference between actual observation of computer use in teaching—3.6% [3 of 84 teachers] and the purported use—96%—seems nothing short of stunning.

The dilemma of "best practices"and teacher preparation

According to Sternberg [1995], expert teachers are those who "possess knowledge that is more thoroughly integrated — in the form of scripts, propositional structures, and schemata--than is the knowledge of novice teachers" [p. 11]. One of the difficulties of integrating computers effectively into the curriculum may be that teachers have not yet begun to integrate the use of computers into their teacher "scripts." Indeed, of the three teachers who used computers, only one [George, to be discussed later] seemed to have integrated computers seamlessly as part of his pedagogical toolkit.

A second teacher [of sixth graders] arranged her class so that all twenty-seven students sat in a circle on the floor around a computer monitor "interacting" with a science CD-ROM. She selected one student at a time to walk up to the terminal and point and click on an object on the screen while the other twenty-six children sat, watched, and listened-- a technique that we found to be of questionable educational value. A third teacher who integrated computers as instructional tools used the four Internet computers in her classroom as stations where students could pursue their individual research projects once or twice a week. When we observed the class, the students assembled around the computers were seeking information concerning the life and times of William Shakespeare. While there may be nothing inherently superior about learning that is facilitated through the use of computers, our research helps point out the entrenched, almost covert resistance to computers as instructional tools.

The dilemma faced by many teacher education programs is that they must prepare prospective teachers who are informed users of technology at a point in time when few practicing teachers seem to be exhibiting the kinds of expert behaviors that would qualify them as practitioners of computer-mediated "best practices." Indeed, if prospective teachers are going to be expected to move beyond the methodology of the teachers who taught them, the need for living, breathing teachers who use computers creatively and effectively is essential. Below, we offer some observations of a day in the life of George, a fifth-grade teacher and the "star" of the cohort of 84 teachers. George seemed to use computers effectively, though his classroom was not particularly well equipped and he learned about computers without the assistance of any college coursework or help from the district administration.

George, an exemplar of "best practice"

At 9:00 on a Tuesday morning, George is describing the listed day's events, written on the chalkboard to some fifth graders seated in a semi-circle, on the floor. After the description, the students disperse to their desks as they are instructed to begin with the Language Arts unit. Some students pull-out their journals, others turn to the hand-out from the student teacher, and three girls in one corner take out novels from their book bags. George announces that he expects the students to continue the special research projects. He bids Jon to move to the scanning station [a Pentium 75 hooked to a scanner and a color inkjet printer] with his baby picture. Jon is shown how to scan his picture using a generic scanning software. After he scans, the image is cropped and pasted on a card in Microsoft Publisher. Jon selects the appropriate "Happy Birthday" text and wording for the card. George helps him print and fold the card. Two other students rush to see Jon's finished product which he completes in about seven minutes.

George next beckons Stacy to join Jon at the scanning station, bringing along a recent picture of herself. Jon moves to the chair next to her to assist her in creating her Xmas card. Jon's words and actions indicate a slight hesitancy as he and Stacy explore the steps from scanning to card creation. But, as Stacy darts to the printer to retrieve the card, the look on both faces changes to quiet confidence. It is now Stacy's turn to assist Mike in creating his Thanksgiving card.

At George's laptop [the only computer with Internet access], Josh is searching for pictures to include in his research project on minerals. He suddenly remembers that he forgot his picture for the greeting card project, so he decides to page his dad on the Internet. He logs on to "www.metrocall.com" and leaves a message on his dad's toll-free pager number, to "drop-off the baby picture at school." He then logs on to www.altavista.com [a search

engine on the Internet] for pictures on minerals. He first searches the keyword "quartz" and sorts through some hits on wrist-watches. He then searches for "minerals" and gets several more hits, one of which is simply titled, "Rhombohedron." He clicks on that site and discovers 20 or more colorful digital pictures of six-sided prisms. He bookmarks the site and prints some pictures. The printed pictures are added to his resource folder which also contains magazine clippings, photocopies from books, and a crumpled set of handwritten notes.

Until the fall of 1996, the only computers at George's school were Apple IIe's. In the Fall of 1996, George and a concerned parent networked the donated Mac Classic IIC's to the only laser printer in the school. For years, the only computer with Internet access in school has been George's laptop [though the school is scheduled to be wired as this is being written], and he paid for the America On-line [AOL] account from personal funds.

His class now has 4 computers: a Pentium 75, a Compaq laptop [Pentium 150], a Mac Performa 616CD, and a Mac LC. In addition to some input and output peripherals such as a scanner, a digital camera, and printers, he also has a television and VCR set. Although George teaches 5th grade, some 4th and 6th graders participate in the language arts and math learning activities upon occasion. Although George would not mind if his school had a computer lab, he prefers having computers in his classroom as part of the learning environment. George encourages students to pursue divergent thinking by using whatever other resources they can get their hands on. During the first semester of fifth grade, George introduces students to:

- Classroom resources [digital camera, computers--CD-ROM, scanners, Internet sources and databases, textbook, and publications],
- School-based resources [library, VCR, camcorder, and photocopier]
- Community resources [parents, good hiking trails, and libraries].

George balances direct instruction with collaborative and inquiry approaches. When George brings in new technology, he will demonstrates use of a tool to the entire class, then walk several students through the entire process individually. Next, the students who received individual instruction, in turn, assist a classmate. When a student gets confused or needs help George will refer them to resources in the room rather than give straight answers. "I expect students to develop critical and higher order thinking and they won't get that by my class if I spout off the answers all the time. Frustrations arising from using new technologies and doing research are part of life. Students need to learn such life lessons."

He admits that his teaching practice during the first semester is largely direct instruction, but maintains that 5th graders need to be taught the inquiry process as well as see it modeled before they are required to collaborate and/or independently explore with multimedia tools.

His second semester activities often involve data gathering for science and math projects to writing, editing, and publishing in language arts. Some of the publications are on-line, but one project revolves around the production of an annual section in the local newspaper.

George's assessment methods include student self-evaluations and documentation of the processes students use to create their projects. He insists students keep portfolios that fulfill a few rigorous requirements, though he allows students to customize their portfolios to some extent to reflect their personal interests. George regularly schedules conferences with students to discuss portfolios.

The desperate need for models of best practice

There is a private university in the Southeast that graduates 1000 undergraduates and 500 graduate teacher education students every year. The College of Education at this institution is housed in a 100,000 square foot building that includes 113 miles of fiber-optic cable, 1100 plug-in ports hooked to the Internet, and at least one multimedia laboratory in every room. The teacher's station has a pop-up LCD panel, which can electronically control a screen that drops down out the ceiling, mechanized drapes which can be opened and closed at the touch of a button, and a built-in projector in the ceiling for illuminating computer screens, videos, or cable television programs. Access to the building and to each room within the building is controlled by card-readers which restrict access to only those who possess the correct chip. One floor of the building is dedicated to graduate students, who eagerly plod away in corporate-type offices on projects for professors who may want to design supplemental course materials on CD-ROM.

A few blocks away from this university is an inner city public school, in which there are few classrooms with computers for teachers, let alone students. Windows are broken, doors are chained shut, there is no Internet access, and no teacher has an office of her own. Imagine the soul-searching that a prospective teacher who gets trained in the private university teeming with high-tech toys undergoes the first day that she steps foot in the battened-down urban school down the street. To what extent can she draw on her university courses to enhance instruction in such a foreign and technologically barren environment?

From our research of computer use among practicing teachers, it would difficult to foresee that the prospective teacher in this situation would find a willing, technologically-innovative mentor among the school faculty who could ease her transition into teaching, while simultaneously encouraging her to take chances in her choice of instructional methodologies. To be sure, without models of best practice, like George around, someone to demonstrate the plausibility of technological approaches, most pre-service teachers would likely adopt survival strategies that minimize complexity and eschew the kinds of complications that computers inevitably bring.

Perhaps the time is right for the establishment of a National Technology Project, a nationwide program built along the lines of the highly-successful National Writing Project, a professional development effort that has trained over 100,000 teachers over the past quarter of a century to become better teachers of writing. By using a teachers-teaching-teachers model such as that of the National Writing Project [Gray & Sterling, 1995], a National Technology Project could provide the ongoing professional development necessary to bridge the gap between the reality of public schools struggling to get up to speed and vast potential offered by emerging technologies. Teachers are key to educational reform. Although teachers like George seem to be quite rare, it is they who must help lead the transformation.

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